

The reference pick-off mirror (RPM) is used to spatially separate the measurement beam and reference beam in a high performance interferometer for the Space Interferometry Mission (SIM). A mask in front of the RPM generates a “core” measurement beam that is reflected off the RPM (See Fig 1). The core beam then travels to two corner cubes (fiducials A & B) and the returned beam reflects off the RPM again to the detector. The mask also generates 2 crescent shaped beams that travels through the RPM to the detector. The dimensions of the mask are given in Fig 1. Note the mask is really oriented with the crescent beams above and below the plane of the paper. The RPM is also oriented with the compensators above and below the plane of the paper. There are several design drivers for the RPM: a) minimal cross-talk between the core and crescent beams in the presence of diffraction to reduce cyclic errors; b) compensation of dn/dT and thermal expansion in the two paths to reduce thermal errors; and c) minimize non-common paths.

Figure 1

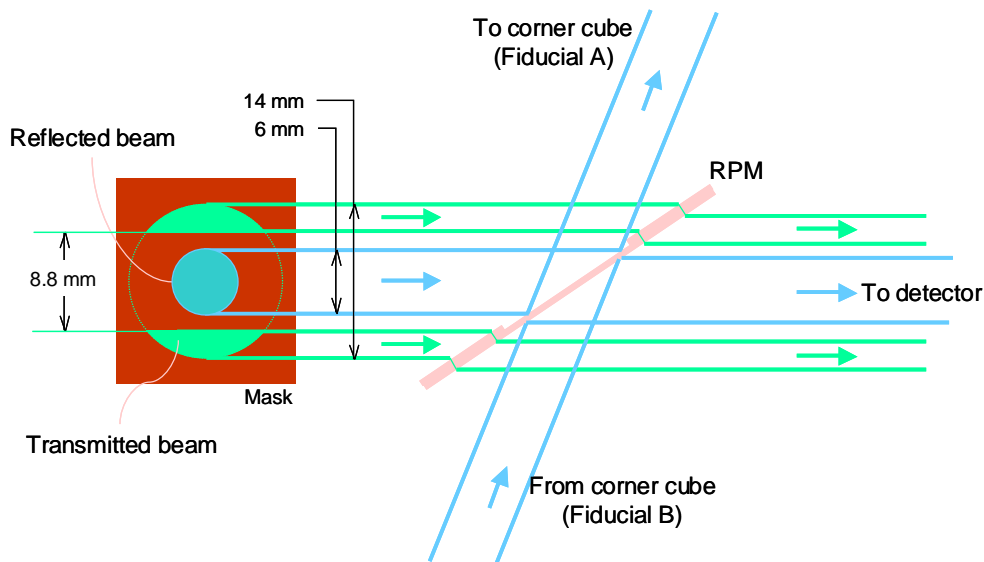


Figure 2 raytraces the path of the core beam. The 6mm diameter core beam refracts at the S1 surface of the mirror base over mask1, transmits through mirror base glass, internal reflects from the mask1 mirror on S2, and refracts out again through the S1 surface over mask1. This beam returns to the RPM after hitting two cornercubes in a racetrack geometry. This return beam externally reflects from the mirror base mask1 mirror. Note that the core beam does not go through the compensator glass.

Figure 2

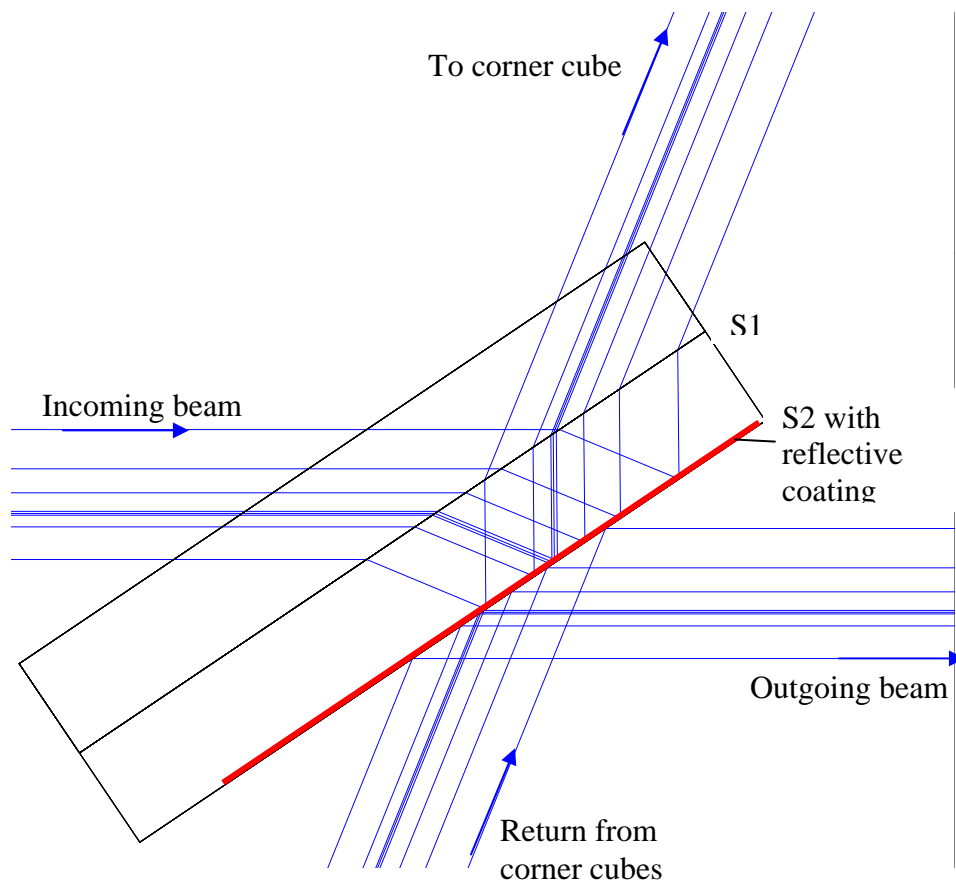
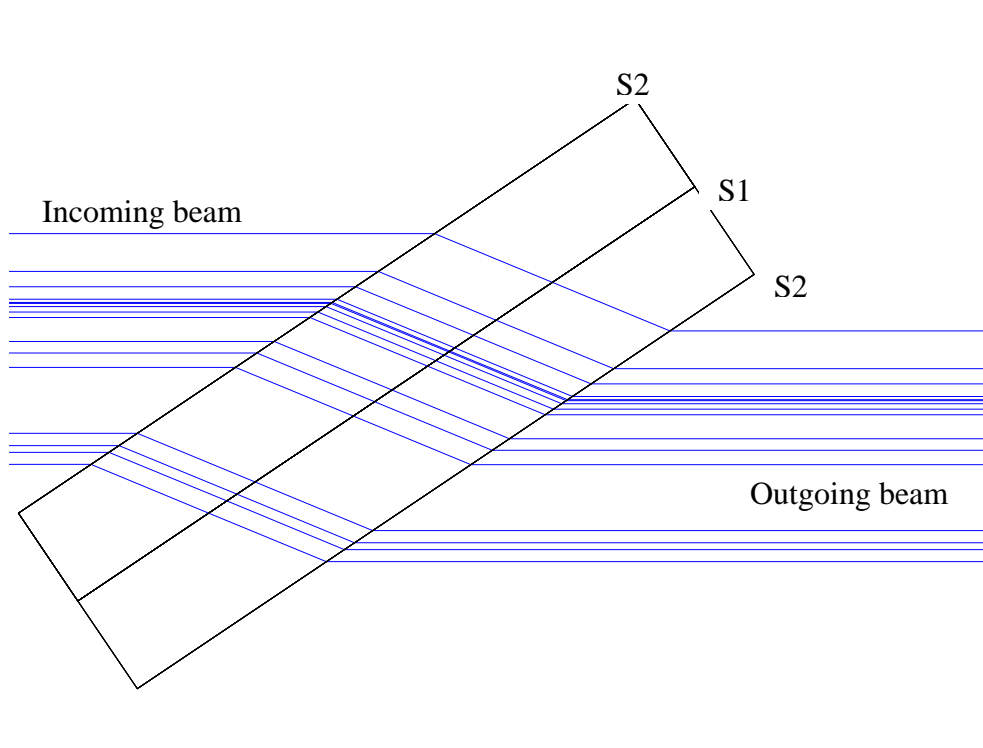


Figure 3 raytraces the path of the outer beam. The crescent shaped outer beam refracts through surface S2 of the compensator, transmits through the optical bond surface S1 (Datum A) of compensator and mirror base, and refracts out through surface S2 of the mirror base.

Figure 3



Approach

To meet the stringent requirements, JPL envisions the compensator bars be cut from the same parent substrate, and bonded using solution (e.g. KOH) assisted optical contacting techniques.

